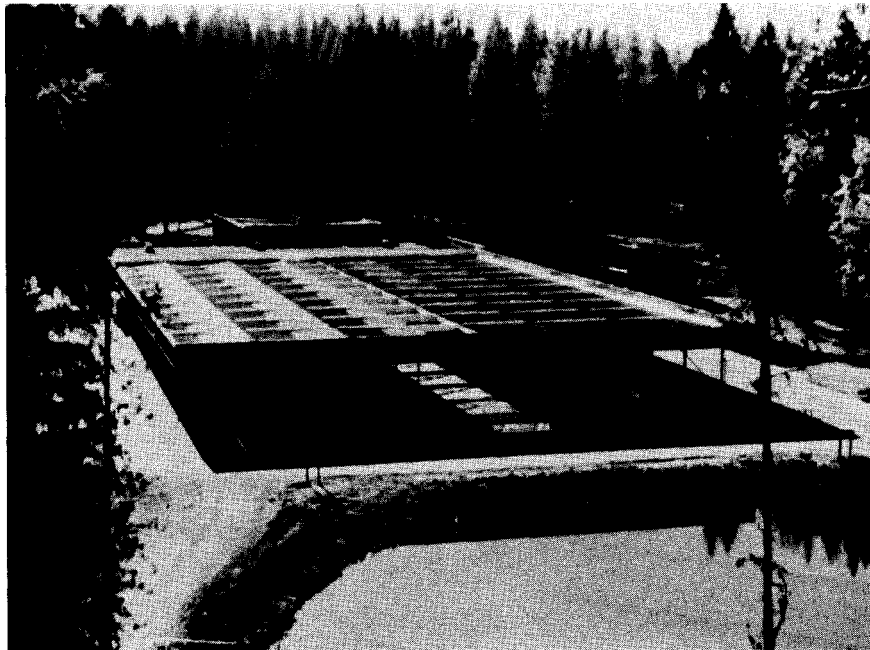




McCALL SUMMER CHINOOK SALMON HATCHERY

ANNUAL REPORT

**1984 Brood Year
For Contract # 14-16-0001-86504**



By

**Tom Frew
Fish Hatchery Superintendent II**

October 1986

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**Brood Year 1984
Production Report
McCall Summer Chinook Salmon Hatchery**

ABSTRACT

Due to the critically low levels of Idaho's salmon runs, caused in part by hydroelectric dam development on the lower Snake River, Congress enacted the Water Resources Development Act in 1976. McCall Summer Chinook Salmon Hatchery was the first hatchery built to enhance the salmon runs under this act. The hatchery was built in 1979, and brood year 1984 was the first time that the production goal of 1,000,000 smolts was met. A total of 1,529 adult salmon were trapped at the South Fork of the Salmon River satellite facility in 1984. Three hundred fifty two female chinook yielded 1,526,832 green eggs during spawning. From these eggs, 970,348 smolts were raised and released in March 1986. In addition, there were 100,149 fry outplanted into tributaries of the South Fork of the Salmon River.

There were no major disease problems encountered during the rearing cycle at the hatchery. Survival from green eggs to smolt was 63.5%. "Spring Thing" accounted for approximately 4% loss during the months of April and May 1985. This is down from a loss of 20 to 25% incurred during previous years. This problem has been found to be nutrition related, and the addition of 10 times the normal pantothenic acid to the early rearing diet appears to control the mortality.

The production of the 970,348 smolts and 100,149 fry used 110,914 lbs. of feed. This gave a conversion of 2.39 lbs. of feed to create one lb. of fish. The feed cost was \$0.9740 per lb. of fish.

Author:

Thomas S. Frew
Fish Hatchery Superintendent II

INTRODUCTION

Construction of hydroelectric dams on the Columbia and Snake rivers have reduced Idaho's salmon runs to critically low levels. In 1976, Congress enacted the Water Resources Development Act, a portion of which is the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP). The LSRCP compensates Idaho for losses of fish and wildlife caused by the Lower Snake River Projects (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dams). The McCall Summer Chinook Hatchery was the first hatchery built as partial fulfillment of the LSRCP.

LOCATION

McCall Hatchery was constructed in 1979 by the U.S. Army Corps of Engineers. Operation funds are provided by the U.S. Fish and Wildlife Service (USFWS), and the facility is staffed and operated by the Idaho Department of Fish and Game (IDFG). The hatchery is located within the city limits of McCall, Idaho, on the North Fork Payette River approximately 1/4 mile (0.16 km) downstream from Payette Lake (Appendix 1).

OBJECTIVES

The objectives of the McCall Summer Chinook Salmon Hatchery are:

1. Restore summer chinook salmon (Oncorhynchus tshawytscha) to the South Fork of the Salmon River, historically a major summer chinook spawning stream in Idaho.
2. Trap and spawn adult salmon returning to the South Fork of the Salmon River.
3. Raise 1,000,000 summer chinook smolts for release in the South Fork of the Salmon River.
4. Establish a summer chinook salmon egg bank for future reintroductions into other drainages.
5. Evaluate fish rearing capabilities of the McCall Hatchery.

FISH REARING FACILITIES

Fish rearing facilities include: 26 eight tray stacks of Heath incubators; two fiberglass Heath troughs 1.75' x 15.5' (53.34 cm x 472.44 cm); 14 concrete vats 4' x 40' (1.22 m x 12.19 m); two outdoor

concrete rearing ponds 42' x 200' (12.8 m x 60.96 m); and one collection basin 15' x 101' (4.57 m x 30.78 m). Designed capacity of the hatchery is 1,000,000 smolts averaging 17 fish per pound (37.4 fish per kilogram) (Appendix 2).

An adult trapping and spawning facility is located on the South Fork of the Salmon River near Cabin Creek, approximately 26 miles (41.8 km) east of Cascade, Idaho (Appendix 1). This facility is equipped with a removable weir, fish ladder, trap, two adult holding ponds 10' x 88' (3 m x 26.8 m), and covered spawning area. Water is supplied from the South Fork of the Salmon River through a 33-inch (84 cm) underground pipeline. Holding capacity for the facility is approximately 1,000 adults.

Adults trapped in excess of egg requirements are passed above the weir for natural spawning (Appendix 3). Eggs collected at the facility are transported "green" to McCall for incubation, hatching, and rearing. Resulting smolts are transported back to the South Fork of the Salmon River for release.

WATER SUPPLY

Hatchery water is obtained from Payette Lake through a 36-inch (91.4 cm) underground pipeline. Water may be taken from the surface or from a depth of 50 feet (15.25 m), thus providing the capability of obtaining the best water temperature available. Through an agreement with the Lake Reservoir Company (water users), 20 cubic feet per second (570 liters per second) can be used for hatchery operations. Design criteria was established using this constraint; therefore, the hatchery has enough water to meet production goals.

Water quality analysis reveals a somewhat "distilled" system for rearing fish. Total hardness ranges from 6.3 to 7.06 mg CaCO₃/l while pH stays at about 6.8. There are no problems with heavy metals and while we have had gas supersaturation, it has not posed any serious problems.

STAFFING

The hatchery is staffed with three permanent employees: a hatchery superintendent II, a hatchery superintendent I, and a fish culturist. In addition, two eight-month and two three-month temporary employees are employed to assist during the busy field season.

FISH PRODUCTION

A record number of summer chinook returned to the South Fork of the Salmon River in 1984. The weir was installed on July 5, 1984, and

trapping operations continued until September 10, 1984. During this period, 1,529 salmon were trapped (Table 1).

Fork lengths were taken on all the salmon that returned to the weir (Fig. 1).

Jacks <65 cm (26 in.) represented 38.9% of the run this year. These fish were from the 1983 release of 183,896 smolts. The 1,259 four year olds were returns from the 1982 release of 122,247 smolts, and the 151 five year old fish that returned were from the 1981 release of 248,926 smolts (Appendix 8).

Of the returning fish, 733 had adipose fins absent, indicating the presence of a coded wire tag. The snouts were collected and sent to the IDFG laboratory in Lewiston for tag recovery and code identification.

All of the coded wire tag return percentages correlated closely with the percent released, with the exception of the five year old fish. Although 53% of the 1979 brood year fish released were tagged, only approximately 30% of the returning five year olds from this brood release were tagged (Table 2).

Spawntaking began on August 6, 1984 and concluded on September 4, 1984. There were nine separate egg takes in 1984. During this period, 586 males were used to fertilize the eggs from 352 females.

The mean fecundity was 4,337 eggs per female; this was 150 eggs per female better than the 1983 spawning season. A total of 337 fish, including 124 females, 174 males, and 39 jacks, were released upstream of the weir to spawn naturally.

Trapping mortality was higher this year than last. We lost 25 males, 10 jacks, and 26 females, or 3.9% of the total trapped. This loss may have been a result of an infestation of Ceratomyxa shasta. This organism was found in much higher densities in the holding pond mortalities than in the fish that survived to spawning (see Fish Health).

There were no drugs or chemicals used on the adults, and all of the carcasses were given away. The Shoshone-Bannock Tribe received 400 jacks for distribution to tribal members, and the rest of the fish were given to the general public on a first come first served basis.

EARLY REARING

After fertilization, all eggs were water hardened for one hour in a 2 ppm (active ingredient) concentration of erythromycin phosphate (Gallomycin, Abbott). They were then transported to the hatchery where they were disinfected for 10 minutes in a 100 ppm (titratable iodine) concentration of Argentyne, buffered with 0.5% sodium bicarbonate.

Table 1. McCall Hatchery summer chinook salmon adult return data by year.

Run date	Jacks	4 year males	4 year females	5 year males	5 year females	Total
1980	92	50	24	2	1	169
1981	124	171	135	31	63	524
1982	48	294	168	12	28	550
1983	504	108	164	85	76	937
1984	595	296	417	135	86	1,529
1985	828	467	792	47	104	2,238

Table 2. Coded wire tag correlation. Summer chinook salmon smolts released and 1984 adults returned to the South Fork of the Salmon River Satellite facility.

Age	Brood year	Percent released marked	Percent returned marked
Jacks	1981	33	36
4 year	1980	69	63
5 year	1979	53	32

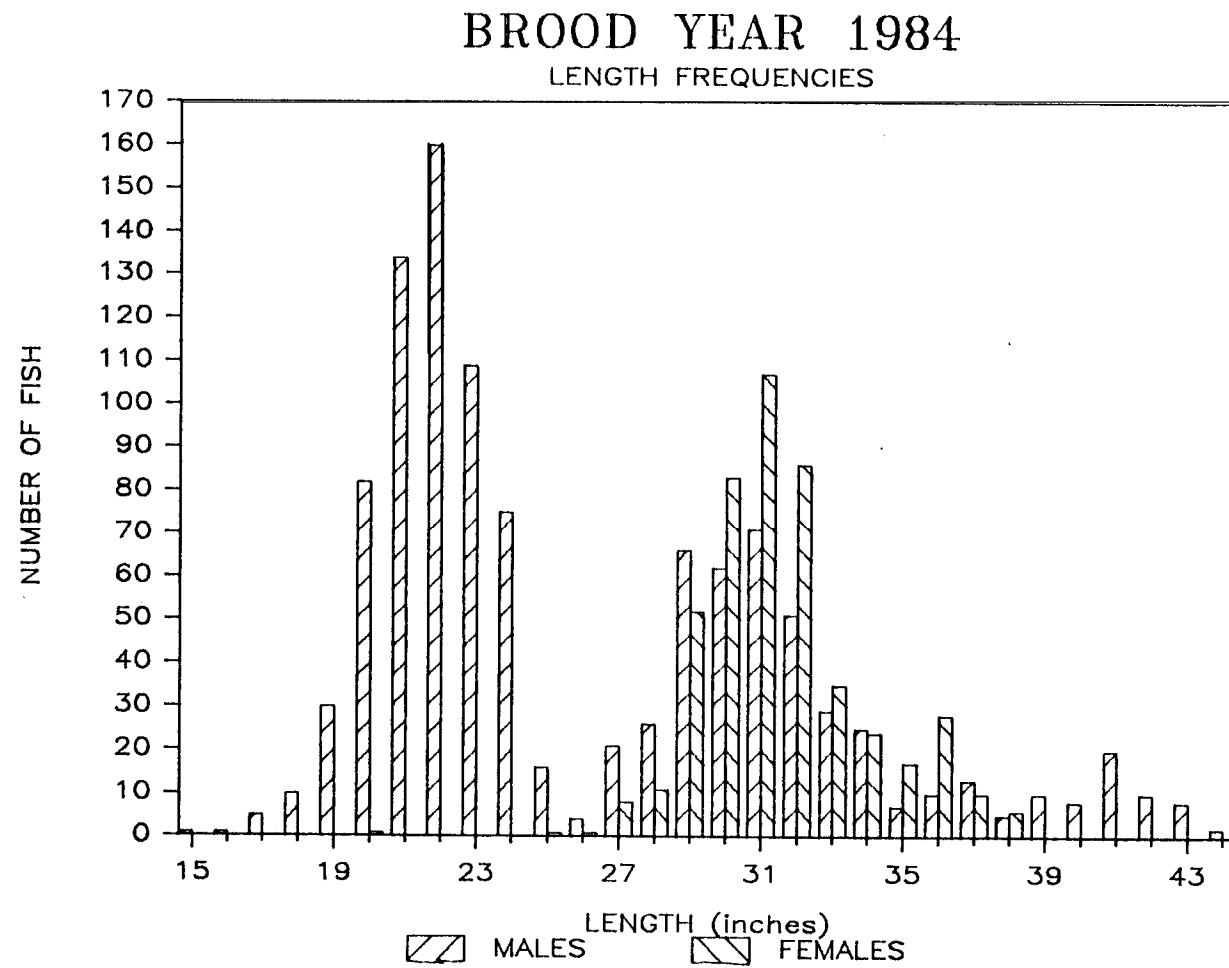


Figure 1. Length frequencies of the adult summer chinook salmon trapped at the South Fork of the Salmon River Satellite facility.

Approximately 80 fluid ounces of eggs were placed in incubators supplied with 6 gpm flow. The number of green eggs was estimated using the displacement method.

The eggs eyed after accumulating approximately 500 daily temperature units (TU), at which time dead eggs were removed using the salt flotation method. From the 1,526,832 green eggs collected, 1,230,615 eyed eggs (80.6%) were counted using the water displacement method and placed in Heath incubators at 80 ounces per tray. Five thousand eyed eggs were shipped to the Fish Cultural Development Center in Bozeman, Montana for evaluating water re-use systems. The remaining eggs hatched at approximately 900 TU's, and swim-up fry were transferred to the vats after accumulating 1,550 TII's. Of the 1,225,615 eyed eggs, 1,181,876 swim-up fry (96% survival) were set out to the vats. The initial loading rates ranged from 76,300 to 93,712 swim-up fry per vat.

The vat rearing volumes were established and changed by setting screens and drop gates at various distances and depths, ensuring that fish densities were maintained at or below the Maximum Density Index (MDI) as recommended by Klontz (1979). A flow index of approximately 0.3-0.4 was maintained through the indoor rearing phase and increased to a maximum of 1.2 immediately prior to ponding.

The flows during indoor rearing ranged from 3-4 turnovers per hour while the flows in the outdoor ponds were maintained at 1.3-1.5 turnovers per hour.

The fish were held in the indoor rearing tanks until they were approximately 250 fish per pound (550 fish per kilogram). They were then transferred to the outdoor ponds and reared there until they were released at 21.35 fish per pound (47 fish per kilogram). The survival rate of the 1,181,876 swim-up fry to ponding was 97% or 1,151,438 fish (Fig. 2).

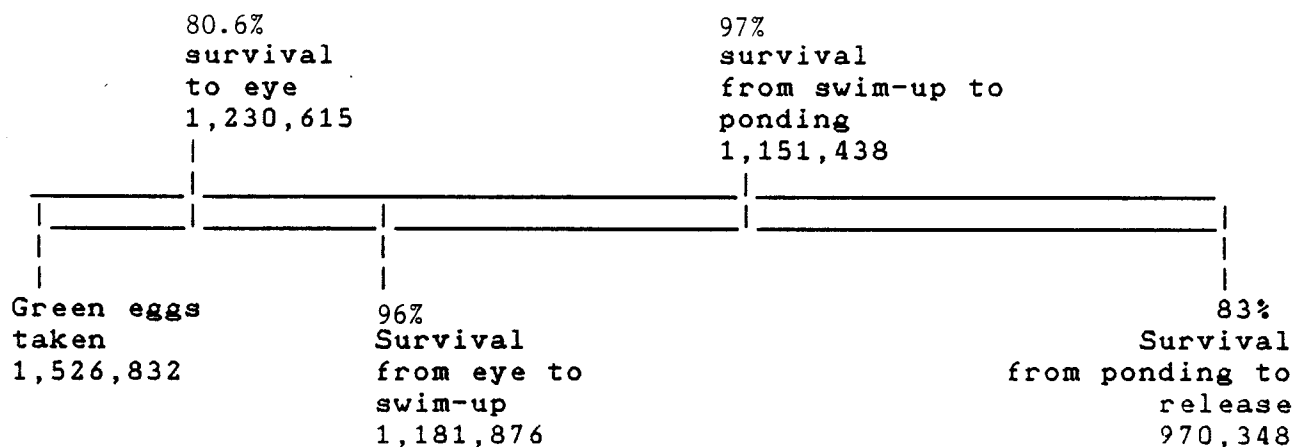


Figure 2. Survival of the brood year 1984 summer chinook at various life stages.

Water temperatures of 36-38 F (3-4 C) during early rearing at McCall resulted in extremely slow growth rates (Appendix 4). The daily length increase, (ΔL), during the cold water rearing was only 0.005 inches (0.127 mm). As water temperatures increased, growth rates also increased. During the summer months, the daily length increases ranged between 0.01-0.023 inches (0.254-0.584 mm) due to warmer water.

The swim-up fry were initially fed OMP starter mash (3% body weight) for the first two days on feed. For the next five days, they were fed a 1:1 mix of starter mash and OMP-IV 1/32 (0.8 mm) pellet. For the remainder of the indoor rearing, they were fed the 1/32 (0.8 mm) pellet at levels determined by the formula: $\%BW = \text{Hatchery Constant} / \text{length}$, where Hatchery Constant = Conversion $\times 3 \times \Delta L \times 100$ (Table 3) (Piper et al. 1982).

Once the fish were ponded outside, feed size changed as growth increased with the 1/8 (3.175 mm) OMP-II pellet being the largest size fed to the smolts. Feeding frequency varied with fish size. Swim-up fry were fed hourly, fingerlings were fed six times per day, and pre-smolts were fed four times per day.

Fish were inventoried on the 1st and 15th of each month. Length/weight relationships were determined, feeding levels adjusted, MIDI calculated, and the fish monitored for general health.

Hatchery vats were cleaned daily, and brushes and nets designated for each vat were disinfected in a 600 ppm Benzalchonium Chlpride (50%) solution after each use. Hatchery personnel were required to disinfect their hands before cleaning any vat. Mortalities were collected daily, recorded, and frozen for disposal. The outside rearing ponds were cleaned as needed by means of a vacuum system with eventual discharge into the settling pond. Outside mortality was collected daily, recorded, and frozen for disposal.

FISH DISTRIBUTION

Fish Tagging

During the period November 5 to November 8, 1985, fish were coded wire tagged, fin clipped, and freeze branded. Of the 50,785 fish which were coded wire tagged and adipose clipped, 43,487 received a right dorsal "Y" in the third position (RD-"Y"-3) (Table 4).

In addition, 317,337 fish received coded wire tags and adipose clips during the period March 17 to March 26, 1986 (Table 4). These tags are part of the United States/Canada treaty.

Table 3. Hatchery constants and feeding rates used at McCall Hatchery on summer chinook salmon during early rearing, three-year averages.

Month	Conversion	Δ L	Total L.	HC	%BW	Temp. °F
March	3.475	0.0044	1.67	4.59	2.75	37
April	2.870	0.0082	1.90	7.06	3.71	38.5
May	1.875	0.0120	2.35	6.75	2.87	42

Table 4. Brood year 1984 coded wire tag codes and freeze brands used at McCall Hatchery. Numbers not adjusted for tag loss or Mortality.

Dates tagged	Pond number	Number tagged	Tag code	Remarks
11/5/85	1	41,600	10/28/12	Of the total, 43,487 received a RD-"Y"-3 freeze brand.
	1	9,185	10/28/4	
	Total	50,785		
3/17/86	1	105,981	10/30/12	For U.S./Canada treaty Pond 1 had light outbreak of BKD.
	1	64,468	10/30/10	
	2	105,322	10/30/11	
	2	41,566	10/30/10	
	Total	317,337		

Fish Release Information

On August 2, 1985, approximately 50,000 fry (582 lbs., 1,282 kg) were released into Johnson Creek for a University of Idaho study. One-half of the fry were released above a migration barrier and the other half were released below the barrier in an attempt to re-introduce the summer chinook to this tributary of the South Fork of the Salmon River.

When the fry were ponded from the hatchery vats, an excess of 50,149 fish, 336.2 lbs. (740 kg), was identified. These fish were planted into the South Fork of the Salmon River at Stolle Meadows during July, 1985. All of these fry were in excellent condition at release.

During the period March 24 to March 31, 1986, 970,348 smolts weighing 45,450 lbs. (100,110 kg) were released into the South Fork of the Salmon River at the Knox bridge. They averaged 21.35 fish per pound (47 fish per kg) and 4.9 inches (125 mm) fork length (Appendix 5). This represented an 84% survival from ponding to release. Total survival from green egg to release was 63.5% (Fig. 2).

IDFG Pathologist Pat Chapman conducted a smolt quality assessment and found the fish to be in excellent condition with the exception of some infestation of Renibacterium salmoninarum (see Fish Health). In addition, fish were sampled for descaling at the hatchery and also at the release site with no descaling evident at either sample site.

FISH HEALTH

The adult fish that returned to the weir were checked for the presence of Ceratomyxa shasta spores in the intestinal tract by Pat Chapman, IDFG Fish Pathologist. A total of 122 fish were sampled, and of these, 36.1% held spores of Ceratomyxa shasta. There was a greater percent incidence of this parasite in the holding pond mortalities than in the fish that survived to spawn (Table 5).

During examination of the intestines, two other parasites were found. Adult and juvenile tapeworms (which were not identified) were observed in several samples. A sporozoan tentatively identified as Myxidium sp., by Charlie Smith of the Fish Cultural Development Center, was observed in 10.6% of the samples.

There were no disease problems with the brood year 1984 fish through their first winter. Internal fungus, probably Phoma herbarum, accounted for a slight increase in mortality during February 1985. "Spring Thing" mortality began during April and reached full impact during May and accounted for the mortality of 4% of the total population. The use of 10 times the normal level of pantothenic acid in the 1/32 inch OMP diet has shown to be beneficial in controlling the "Spring Thing" problem at McCall Hatchery. With the exception of the

Table 5. Summary of the pathology report on the adult summer chinook salmon trapped at the South Fork of the Salmon River in 1984.

Results

A summary of the pathology report on the adult summer chinook salmon trapped at the South Fork of the Salmon River in 1984 follows:

Ceratomyxa shasta, 122 fish sampled
Survivors vs. holding pond mortality

14 positive/76 spawnouts and slaughtered jacks	= 18.4%
30 positive/46 holding pond mortality	= 65.2%

Jacks, Females, and Males

0 positive/31 jack spawnouts and slaughtered	= 0.0%
4 positive/5 jack holding pond mortality	= 80.0%
12 positive/38 female spawnouts and slaughtered	= 31.6%
8 positive/20 female holding pond mortality	= 40.0%
2 positive/7 male spawnouts and slaughtered	= 28.6%
18 positive/21 male holding pond mortality	= 85.7%

diet experiment vats, the pantothenic acid diet was used exclusively in the hatchery this year. We feel this was the primary reason for the drastic decrease in mortality over the past years (see Special Studies).

After the fish were ponded outside, the fish developed a chronic Bacterial Kidney Disease (Renibacterium salmoninarum) infection. This never became a major problem, but did cause some concern. It became evident during June and caused sporadic loss patterns throughout the remainder of the final rearing cycle.

The drugs, chemicals, and compounds used on the 1984 brood year fish are summarized in Appendix 6.

The fish were in excellent health at the time of release. Pat Chapman sampled for Infectious Pancreatic Necrosis virus, Infectious Hematopoietic Necrosis virus, Erythrocytic Necrosis virus and other viruses with no positives evident. The fish were assayed for Renibacterium salmoninarum bacteria and found to be positive (Table 6).

The 3% heavy positive found in pond 1 was in correlation with the slightly higher mortality rates noted in that pond. Coded wire tag returns will have to be watched beginning in 1987. The tag codes are listed in Table 4.

SPECIAL STUDIES

Nutrition Study

An intensive two-year investigation evaluating various diets on the occurrence of "Spring Thing" at McCall Hatchery was concluded this year. Results indicate this syndrome may be a nutritional problem caused in part by dietary deficiency and the rearing of chinook fry for extended periods in water temperatures of 36-39 F.

Four diets were tested this year: Bio-diet, OMP-IV, OMP-IV with added supplements (vitamins A, B2, C, pantothenic acid, and salt); and OMP-IV plus 10 times the normal amount of pantothenic acid.

Fish in all test groups suffered mortalities from "Spring Thing", but at levels substantially lower than previous years. The percentage of "Spring Thing" mortalities are summarized in Table 7.

Bio-diet led in all test diets in conversion, gain, and reduced mortality while OMP-IV plus 10 times the normal amount of pantothenic acid was a close second. Because of a large price differential, OMP-IV plus 10 times the normal amount of pantothenic acid is the most cost effective for raising summer chinook at McCall Hatchery.

Table 6. Summary of the pathologist report on the brood year 1984 summer chinook salmon smolts at the time of release.

Pathogen	Sample size	Results
IHN virus	30 kidney/spleen in 5 fish pools from each pond	Negative
IPN virus	Same as for IHN virus	Negative
Other viruses	Same as for IHN virus	Negative
EN virus	8 kidney imprints from each pond	Negative
Renibacterium <u>salmoninarum</u>	30 kidney imprints from each pond	Positive

Direct FAT of kidney imprints for Renibacterium salmoninarum yielded the following results:

Pond 1		Pond 2
86.7%	negative	90.0%
10.0%	light positive	10.0%
0.0%	moderate positive	0.0%
3.3%	heavy positive	0.0%

Table 7. Affect of various diets on "Spring Thing" mortality rates in summer chinook salmon at McCall Summer Chinook Salmon Hatchery (Hutchinson, in print).

Diet	Bio-diet	OMP-IV+pa	OMP-IV+supplements	OMP-IV
Percent mortalities	2.4%	3.8%	5.2%	18.4%

ECONOMICS'

A total of 110,914 lbs. (244,303 kg) of Oregon Moist Pellet were fed to produce the 46,368 lbs. (102,132 kg) of fish this brood year (Appendix 7). This resulted in a conversion rate of 2.39 lbs. of fish feed per pound of fish produced. Constant harassment of the fish by ducks and mink during the period October 1985 through March 1986 may have influenced the conversion rate. The feed cost per pound of fish produced was \$0.9740. A chart detailing the breakdown by major class expenditures is shown in Appendix 9.

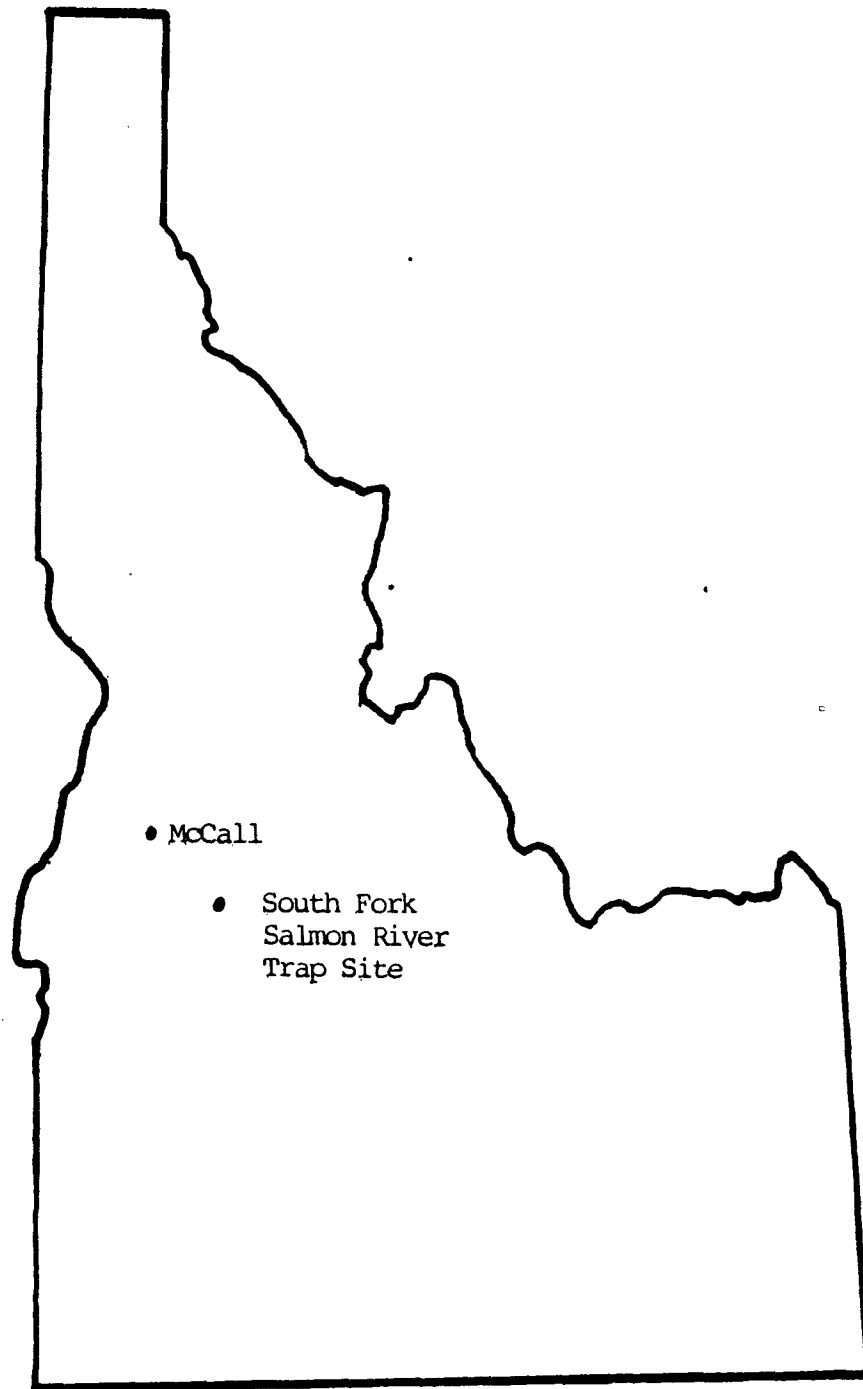
Expenditures for the LSRCF portion of the McCall project totaled \$229,500 for the period October 1, 1984 through September 30, 1985 (Appendix 9). The approximate operating and maintenance cost was \$4.95 per lb. of production. Since the hatchery was operated near design capacity and operating and maintenance costs were normal, the cost of \$4.95 per lb. or \$0.236 per smolt are considered about average for the McCall Hatchery.

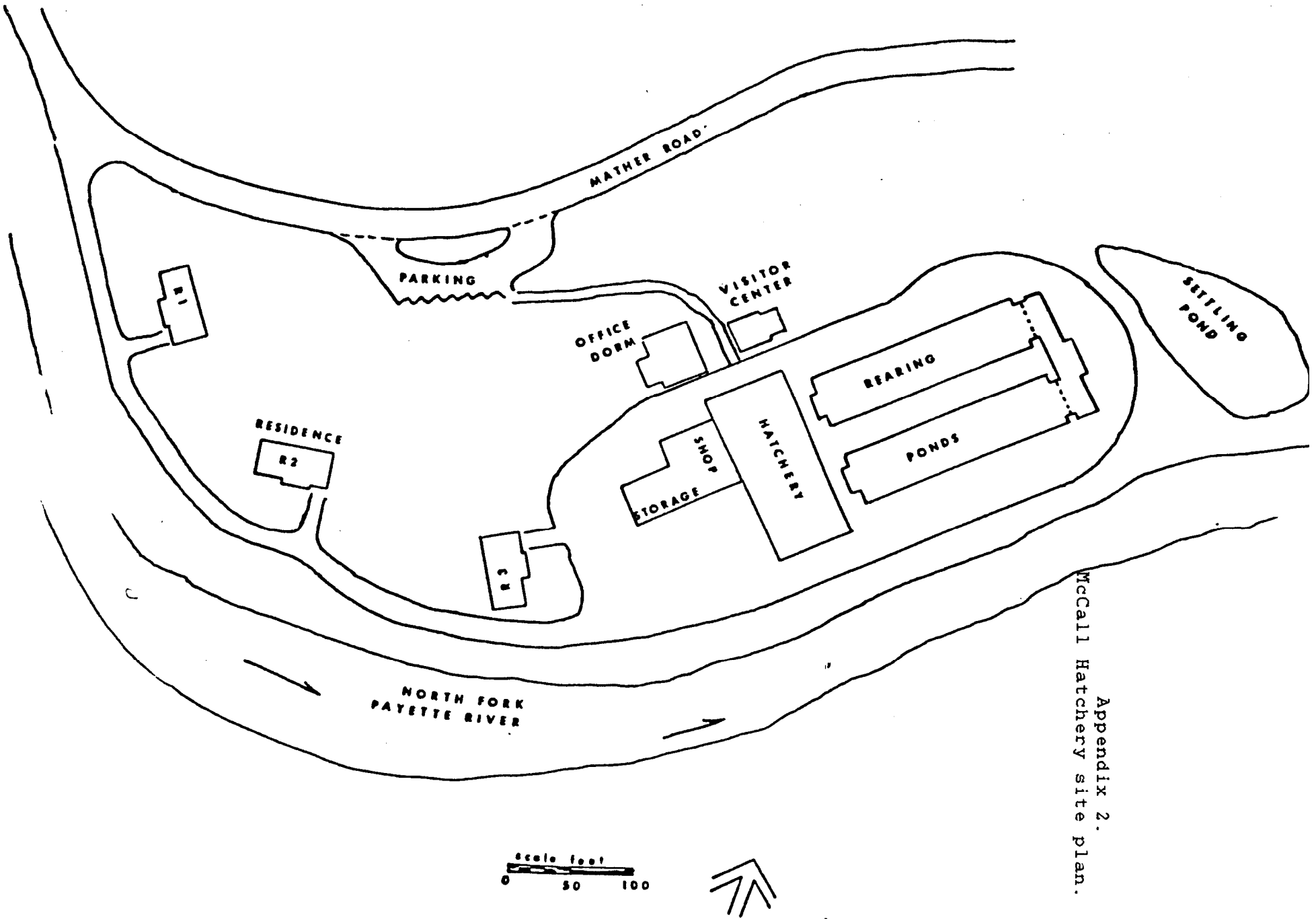
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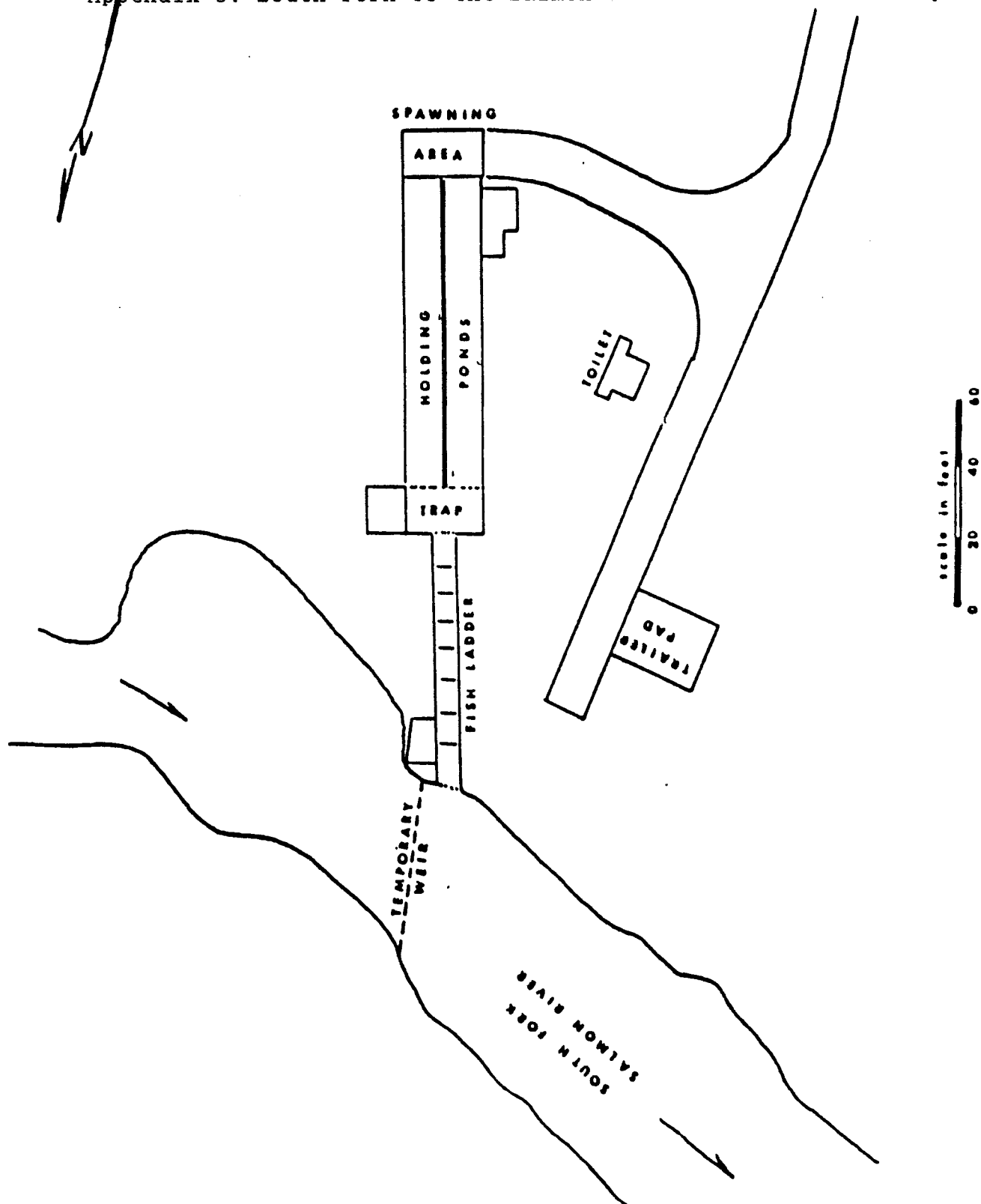
A P P E N D I C E S

Appendix 1. Location of McCall Summer Chinook Salmon Hatchery and trap site on the South Fork of the Salmon River.



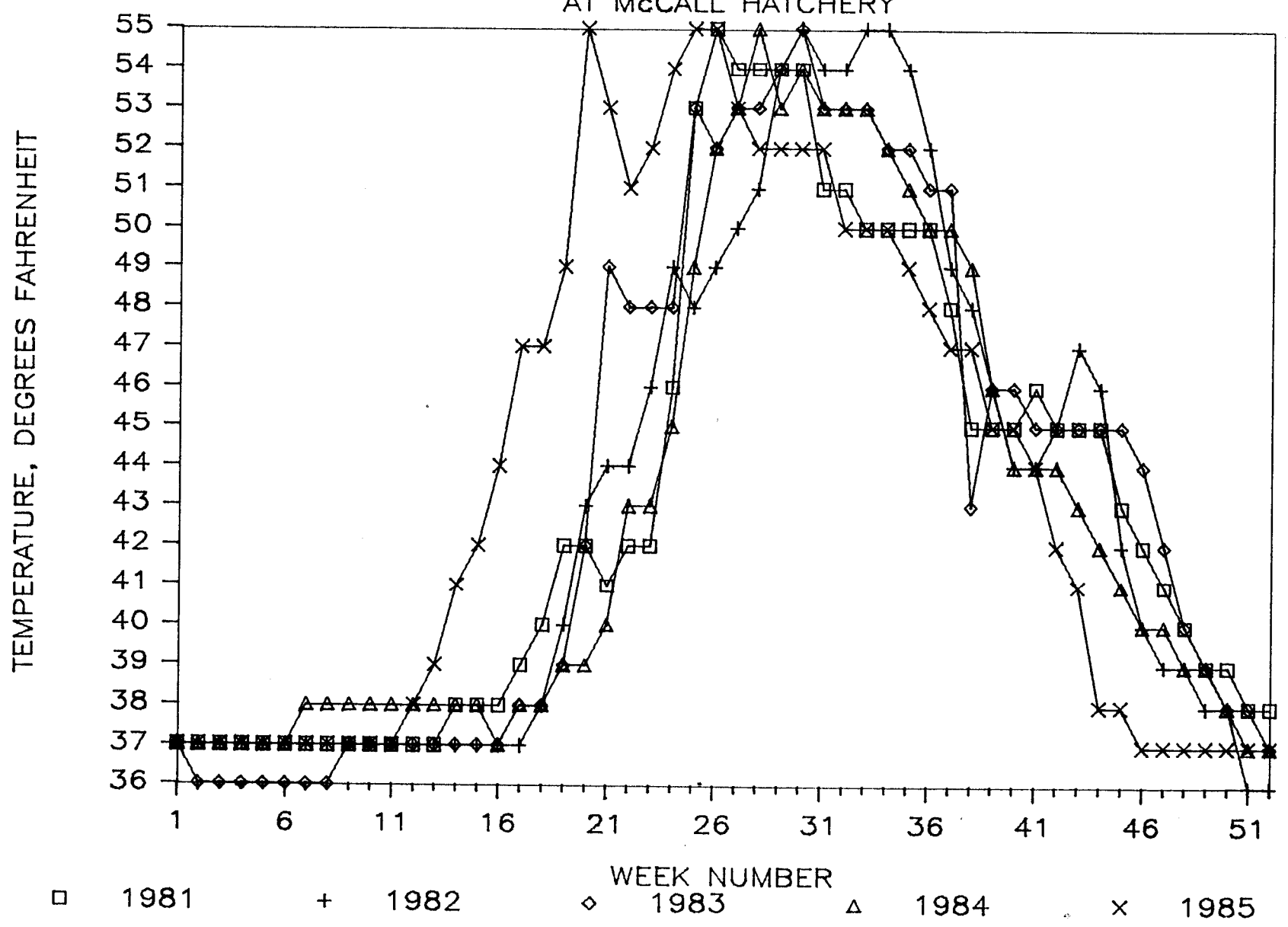


Appendix 3. South Fork of the Salmon River Satellite facility.



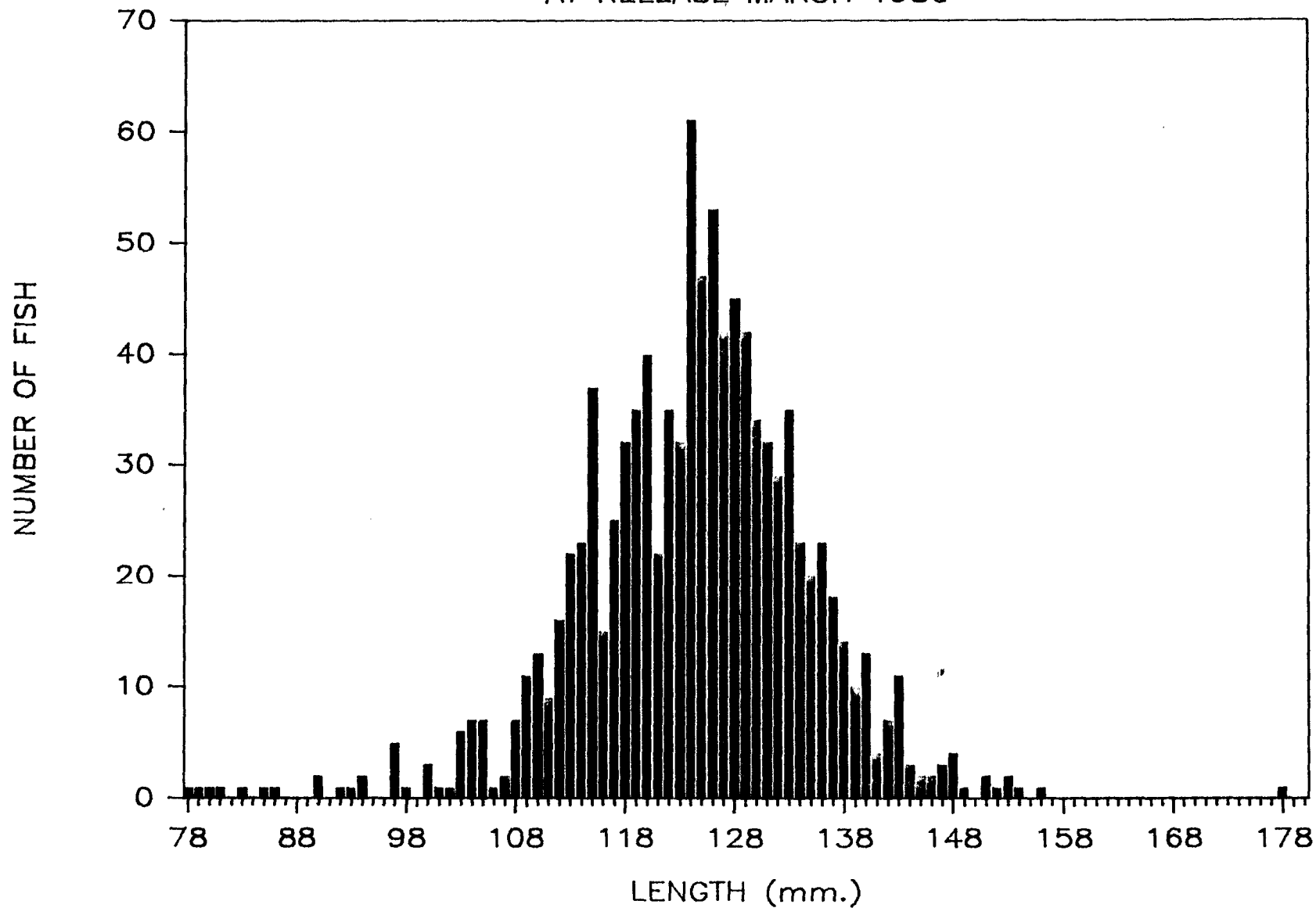
AVERAGE WEEKLY TEMPERATURES

AT McCALL HATCHERY



BROOD YEAR 1984 LENGTH FREQUENCIES

AT RELEASE MARCH 1986



Appendix 5. The length frequencies of Brood Year 1984 McCall summer chinook salmon smolts at the time of release.

Appendix 6. Drugs, chemicals, and compounds used at McCall Hatchery.

Compound	Rate	Use	Source
Erythromycin phosphate	2 ppm active 1 hour	Control BRD on eggs	Abbot Chemical
Iodophore	100 ppm titratable iodine 1 hour	Disinfectant for eggs	Argent Chemical
Sodium bicarbonate	0.5%	Buffer for iodophore	Common baking soda
Formalin	1,667 ppm 15 minutes	Control fungus on eggs	VanWaters and Rodgers
Benzalconium Chloride	600 ppm 1 hour	Topical disinfectant	Argent Chemical
Chlorine	200 ppm 1 hour	Topical disinfectant	VanWaters and Rodgers
Sodium thiosulfate	5.6 gm/ gallons of 200 ppm Cl	Neutralize chlorine solution	VanWaters and Rodgers

Appendix 7. The complete breakdown of feeds used to rear the brood
year 1984 summer chinook salmon at McCall Hatchery.

Size	Cost/pound	Amount fed	Total cost	Source
Starter mash OMP-IV	0.490	250 Lb.	\$122.50	Moore Clark
1/32 OMP-IV	0.4450	300 Lb.	133.50	Moore Clark
1/32 OMP-IV W/10XPA	0.4737	5,000 Lb.	2,368.50	Moore Clark
1/32 OMP-IV Special	0.4950	900 Lb.	445.50	Moore Clark
#2 Starter	0.7364	99 Lb.	72.90	Bio-products
#3 Starter	0.7364	495 Lb.	364.52	Bio-products
1.0 MM Grower	0.6682	220 Lb.	147.00	Bio-products
3/64 OMP-IV W/10XPA	0.4737	4,000 Lb.	1,894.80	Moore Clark
1/16 OMP-IV	0.4625	3,000 Lb.	1,387.50	Moore Clark
3/32 OMP-II	0.4000	18,000 Lb.	7,200.00	Moore Clark
1/8 OMP-II	0.3850	68,650 Lb.	26,430.25	Moore Clark
1/8 OMP-IV	0.4600	10,000 Lb.	4,600.00	Moore Clark
Totals		110,914 Lb.	\$45,166.45	

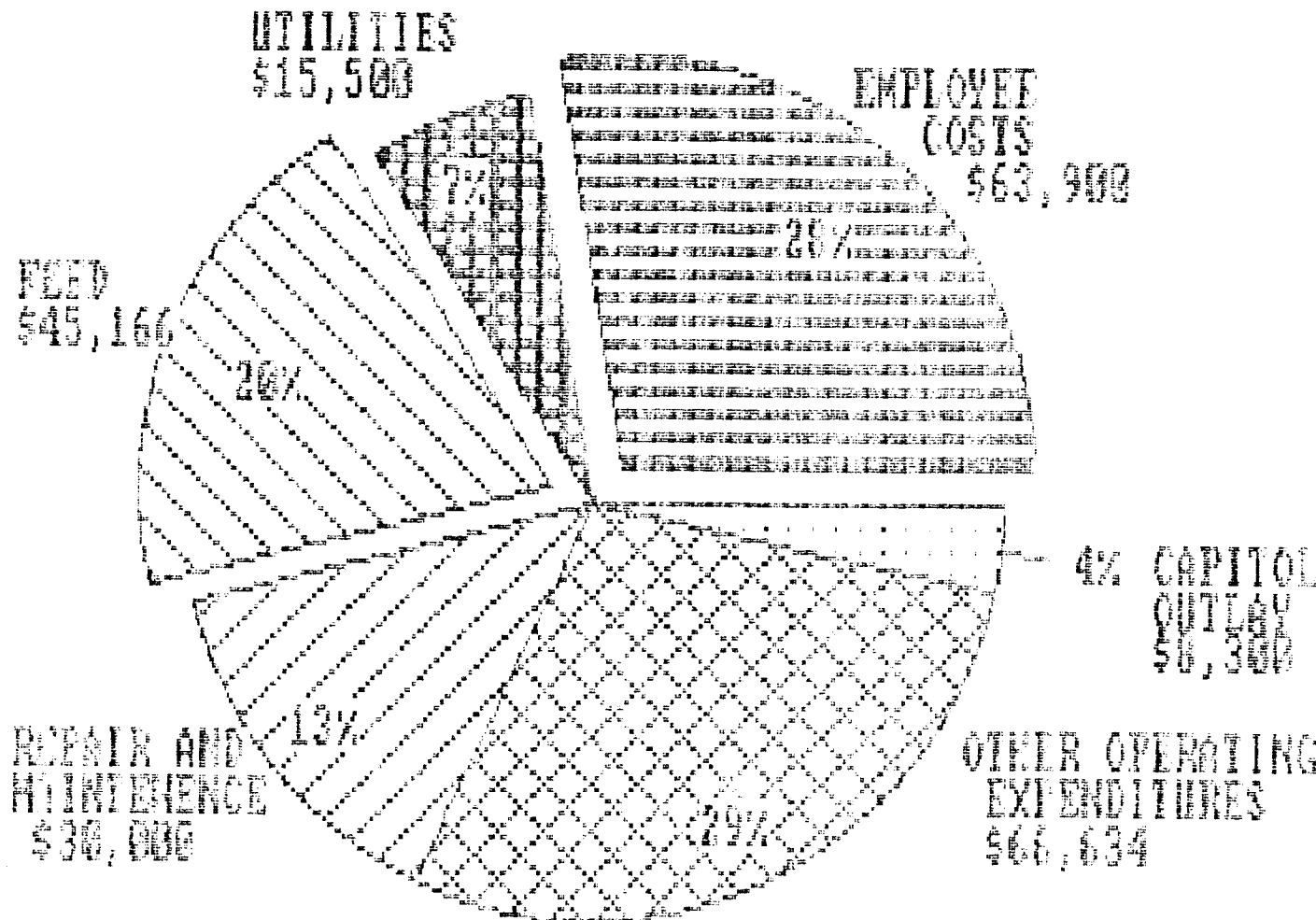
Appendix 8. Correlation of summer chinook salmon smolts released by the McCall Hatchery and corresponding adult returns.

Brood year	Release date	Release number	Returns			Total	Percent return
			Jacks	4 year old	5 year old		
1978	1980	124,800	124	462	161	747	0.598
1979	1981	248,926	48	272	221	541	0.217
1980	1982	122,247	504	713	151	1,368	1.119
1981	1983	183,896	595	1,259	*	**	**
1982	1984	269,880	828	*	*	**	**
1983	1985	564,405	*	*	*	**	**
1984	1986	970,483	*	*	*	**	**

*These fish have not returned yet.

**Incomplete due to unavailable data.

Budget for 1984-1985



TOTAL BUDGET
EXPENDITURES
\$229,500

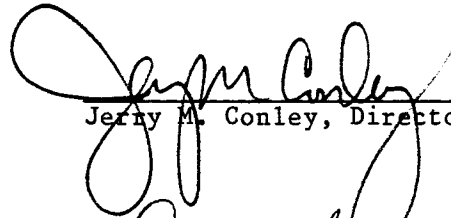
Appendix 9. Breakdown of expenditures for
McCall Summer Chinook Salmon Hatchery
from October 1, 1984 to September 30, 1985.

Submitted by:

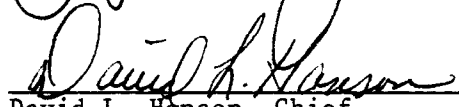
Thomas S. Frew
Fish Hatchery Superintendent II

Approved by:


IDAHO DEPARTMENT OF FISH AND GAME



Jerry M. Conley, Director



David L. Hanson, Chief
Bureau of Fisheries



Steven Huffaker
Anadromous Hatchery Manager